

THE ANALYST.

JUNE, 1901.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

THE monthly meeting of the Society was held on Wednesday evening, May 1, in the Chemical Society's Rooms, Burlington House. The President (Dr. J. Augustus Voelcker, M.A., B.Sc.) occupied the chair.

The minutes of the previous meeting were read and confirmed.

Mr. John Webster was elected a member of the Society.

A certificate of proposal for election to membership in favour of Mr. Frederick Malcolm Wharton, F.I.C., 58, Belsize Road, South Hampstead, assistant to Mr. William Chattaway, and late assayer, Imperial Mint, Nanking, China, was read for the first time.

The following papers were read : "Alkaline Waters from the Chalk," by W. W. Fisher, M.A. ; "Citron Oil," by Herbert E. Burgess ; and a "Note on the Reduction of Iron Salts," by Gilbert T. Morgan, D.Sc.

DETERMINATION OF DISSOLVED OXYGEN IN WATERS IN PRESENCE OF NITRITES AND OF ORGANIC MATTER.

BY DR. S. RIDEAL AND C. G. STEWART.

(*Read at the Meeting, March 6, 1901.*)

ACTUAL boiling out of the dissolved gases from water with gasometric estimation can in most cases only be accomplished in the laboratory. Bunsen's method, described in Fresenius, is fairly simple, but not accurate ; his absorption coefficients have been re-estimated and corrected by Pettersson and Sonden (*Berichte*, xxii., 1439), by Winkler (*ibid.*, 1764), and by Roscoe and Lunt (*Trans. Chem. Soc.*, 1889, 552). Various forms of special apparatus have been devised by Pettersson and Sonden (*loc. cit.*), Sidney Harvey (*ANALYST*, 1894, 121), Adeney (*Trans. R. Dubl. Soc.*, Sept., 1895), Dibdin (*J. S. C. I.*, 1900, 499), and others, but none of them are suitable for use in the field.

Many titration processes have been introduced for rapidly estimating the dissolved oxygen only, but with heavy and fragile apparatus, while some, *e.g.*, Schutzenberger's and Thresh's, require the use of a current of coal gas or hydrogen. Kisch, in an examination of different methods (*Zeits. f. angew. Chem.*, 1891, 105), strongly prefers Winkler's, which employs manganous chloride and soda (*Ber.*, xxi., 2843 ; xxii., 1764). Müller introduced some changes in the preceding, using crystals of manganous sulphate and allowing to stand with the alkali for half an hour. He

mentions the interference of nitrites, and corrects for it by titration of a separate sample with HCl, KI and thiosulphate (*Chem. Zeit.*, xiii., 1188; *J. S. C. I.*, 1889, 923). Romijn keeps the manganous hydroxide in solution by adding Rochelle salt before the soda (*Rec. Trav. Chim.*, 1896, xv., 76). The use of ferrous hydroxide as an oxygen absorbent was antecedent to manganous, and was due to Mohr; it has led to a number of modifications, chiefly in the apparatus, but in every case the instability of ferrous salts renders them less suitable than manganous solutions for field work, and involves extra titrations of the standard. The sample of water, and at the same time an equal quantity of water freed from dissolved oxygen, are treated with ferrous sulphate and soda; after agitation, air being excluded, the precipitated hydroxides are dissolved by sulphuric acid, and the amount of iron oxidized is estimated by titrating both with standard permanganate.

Tiemann and Preusse (*Ber.*, xii., 1768), from a large number of trials, concluded that Mohr's method gave generally too low results, while König and others (*Ber.*, x., 2017; 1880, 154; *Zeit. Chim.*, xix., 259) found it trustworthy.

Lalieu (*Journ. Pharm. Anvers*, 1887, 570) employed ammonio-ferrous sulphate as more stable; the presence of ammonium salts also causes part of the ferrous hydroxide to remain dissolved, and renders the absorption more rapid. He used 200 c.c. of water in a narrow-necked flask with a perforated stopper.

Blarez (*Journ. Pharm.*, 1888, 5, xviii., 55) introduced the use of two superposed bulbs with a capillary tube between and a stopcock below, drawing in the reagents from above by running out mercury placed in the lower bulb; the apparatus was thus complicated and the weight increased.

Linossier (*Journ. Pharm.*, 1891, 5, xxiii., 103) avoided precipitation by the presence of sodio-potassic tartrate, and titrated the free oxygen with standard ferrous sulphate, with phenosafranin as indicator. The process, as described, has several faults, and is unsuited for the field.

Albert Levy, at the Montsouris Observatory, Paris, has in practice a modification of the Mohr-Lalieu method, employing a bulb tube of known capacity, "about 100 c.c.," with stopcocks above and below, and a short funnel above. The bulb being filled with the water, and the taps closed, 2 c.c. of potash solution are added through the funnel by carefully opening the cocks; then, after washing the funnel, 4 c.c. of ammonio-ferrous sulphate are similarly introduced. After agitation the precipitated oxides are dissolved by adding in the same way, after again washing the funnel, 2 c.c. of 50 per cent. sulphuric acid, the contents are transferred to a flask, and titrated with permanganate. The next step is the special feature. As the ferrous solution in the acid state only very slowly takes up oxygen, he repeats the whole operation, *omitting the alkali*; the difference between the c.c. of permanganate used is calculated into oxygen per litre.

Letts and Blake (*Brit. Assoc.*, 1900) fill an ordinary separating funnel with the water, withdraw a measured volume from below, and replace it by standard ferrous sulphate, and then ammonia. The funnel is inverted, and 50 per cent. sulphuric acid passed in by gravity through the tube. Permanganate is used for titration, or bichromate if the chlorides are very high, as in sewage or sea-water. But bichromate, equally with permanganate, is reduced by nitrites and by organic matter.

Thresh (*Trans. Chem. Soc.*, 1890, 185) adds a nitrite and sulphuric acid to the water in a current of coal gas; the iodine liberated is then proportional to the dissolved oxygen, and is measured by thiosulphate. Both the nitrite added and any originally present are separately titrated and allowed for. Organic matter interferes by absorption of iodine. Deventer and Jurgens substitute a layer of petroleum for the coal gas (*Chem. Centr.*, 1893, ii., 546).

Attempts were early made to utilize quantitatively in a direct manner the tints produced by free oxygen in various colourless solutions. This may be done in four ways:

I. Adding the reagents to a measured volume of water and comparing the tint with permanent standards. This, if reliable, would be a very rapid process. Professor Ramsay has recently introduced a very portable box, by which the colour produced by the dissolved oxygen acting on freshly-prepared ammonio-cuprous chloride is compared with standard blue tints preserved in sealed tubes. We received an early specimen of the apparatus, which in its present stage, after numerous trials, we have found to be subject to the following objections:

1. The standards from 1 c.c. to 6 c.c. should be extended to 7 and 8 c.c., as in cold weather many waters contain these quantities of oxygen per litre.

2. Readings are difficult nearer than $\frac{1}{2}$ c.c., and in coloured waters cannot be defined.

3. It is very difficult to obtain a blank; the cuprous chloride in making absorbs oxygen, and the layer of kerosene over the water only partially excludes that gas.

4. Nitrites interfere greatly, as shown by the following experiments:

NOTE.—Two cylinders of equal diameter (3 centimetres) were filled to a depth of 6 centimetres with dilute colourless ammonio-cuprous chloride under 0.5 centimetre of petroleum, and left undisturbed. The liquid gradually became blue under the petroleum. The rate of penetration was as follows:

Hours ...	...	40 min.	1 hr. 40 min.	3	19	38	43	58
Depth of blue in centimetres:								
1st tube ...	...	0.63	0.84	1.0	1.9	3.8	4.6	5.9
2nd tube ...	...	nearly the same as first				2.9	3.6	3.8

At first the penetration is irregular, but afterwards it becomes approximately proportional to the time.

				C.c. Oxygen per Litre.		
				Theory, at 20° C.	Rideal- Winkler.	Ramsay.
Tap water alone ...	...	...	...	6.28	6.11	about 6
Ditto, with five parts nitrous N per 100,000 ...	...	...	...	6.28	6.15	much deeper blue
Water boiled and cooled under kerosene ...	...	...	...		0.78	1.5 to 2
Equal parts of boiled and tap water:						
Without nitrite ...	...	...	...	3.47	3.6	4.2 4.5 4.5 6.5
With nitrite ...	...	...	...	3.47		6.5 6.2

Ramsay's method therefore seems only applicable to fairly pure river or other waters. The presence of nitrates was not found to interfere.

II. Comparing the tint with standards made up at the same time as in Nesslerizing has not worked well in practice.

III. The colour produced by the oxygen is titrated back by means of a standard bleaching solution. Schutzenberger's indigo and hyposulphite process belongs to this category. Its difficulties and disadvantages are well known (Ramsay and Williams, *Journ. Chem. Soc.*, 1886, 751; Dupré, *ANALYST*, x., 156; Roscoe and Lunt, *loc. cit.*, 1889, 552; Adams, *ibid.*, 1892, 310).

IV. Adding the reagents to the sample, and to an equal volume of oxygen-free water, and admitting oxygen or air to the latter until the colour of the sample is imitated; the quantity of oxygen required gives the measure of that present in the specimen of water. This, which is really a titration with oxygen gas, presents many difficulties, and is liable to great errors. Mackay and Middleton (*Journ. Soc. Chem. Ind.*, 1898, 1127) add pyrogallie acid and potash to two equal samples of the water before and after boiling out the oxygen, then admit air gradually to the second till the tint of the first is obtained: as 250 c.c. of water are employed, the volume of residual nitrogen is taken as equal to the dissolved oxygen in c.c. per litre. Among the objections are the bulk and fragility of the apparatus, the time required, the use of coal gas, and the solubility of the nitrogen in the boiled water, a large quantity of which (265 c.c.) is required for each experiment. The analyses given in the paper are hardly satisfactory.

Some years ago we were led to select as the most portable, rapid, and generally reliable process a modification of Winkler's manganese method in preference to all the methods we have described. While it is comparatively easy to titrate the free oxygen in fairly pure samples, such as river and well waters, in sewage and effluents containing nitrites, occasionally sulphides, and much organic matter, great difficulties are introduced. After a large number of experiments, we have found that it is practicable to get rid of the interference by oxidizing with permanganate in acid solution out of contact with air. A further simplification was to discard tap funnels and indiarubber tubing,* and to conduct the experiment in ordinary stoppered bottles of known capacity (about 300 c.c.) when full, the volume of each being etched on the bottle and a coefficient calculated.†

With ordinary waters the proceeding is very simple. The bottle being filled quietly but quickly, 1 c.c. of manganous chloride solution (33 per cent.) is passed to the bottom from a long pipette, then 3 c.c. of a solution containing 33 per cent. soda and 10 per cent. KI. The stopper is inserted, without air bubbles, and the contents mixed by inversion and rotation. The liberated manganous hydroxide absorbs the free oxygen. On standing a few minutes the upper liquid becomes clear; the stopper is then removed for a second, and 3 c.c. of concentrated pure HCl are passed to the

* Roscoe and Lunt, in their examination of Schutzenberger's process with reduced indigo, found that indiarubber tubing allowed a considerable amount of oxygen to diffuse in from the air, also that, when an atmosphere of hydrogen or coal gas is employed, the oxygen rapidly diffuses into it, and then back again in an irregular manner.

† Zeitsche (*Chem. Centr.*, 1899, ii., 727) describes a similar simplification.

bottom by a pipette. Again closed and rotated, the manganese oxides dissolve and iodine is liberated in proportion to the oxygen. At this stage the bottle should be allowed to stand about five minutes in the dark, with occasional moving, till clear. The liquid is then transferred to a porcelain basin, and the iodine determined by thiosulphate and starch.

When nitrites and much organic matter are present, 50 c.c. of the original liquid, acidified with 1 c.c. of concentrated pure H_2SO_4 , are first titrated with decinormal permanganate, till a faint pink colour persists after ten minutes. The number of c.c. so required is calculated to the volume of the bottle in which the free oxygen determination is to be done. This amount is then placed in the bottle, together with 1 c.c. of sulphuric acid (if more than 10 c.c. of decinormal permanganate are required, 2 c.c. of acid must be added), the bottle is filled with the liquid under examination, mixed by rotation, and allowed to stand five or ten minutes. We have found that it is advisable to add 0.1 c.c. of permanganate in excess of the calculated amount, so that the liquid should retain a slight pink colour. Any excess of permanganate affects the determination of free oxygen by liberating iodine, therefore has to be removed. If the solution remains pink, the bottle is briefly opened, $\frac{1}{2}$ c.c. of a 2 per cent. solution of neutral potassium oxalate added with a pipette, the neck filled up with the water under examination, the stopper inserted, and the bottle rotated as before. The colour quickly disappears, and the solution is ready for the manganous chloride, etc., as in the ordinary determination. It was ascertained that the oxalate did not interfere, but to balance the sulphuric acid that has been added a rather larger proportion of soda is required. When working with sewages and effluents we use a 50 per cent. soda + 10 per cent. KI; after oxidizing with permanganate, 3 c.c. of this, and afterwards 3 c.c. of HCl, are added.

The reagents being used in the concentrated form with a comparatively large volume of water, the correction for the additions is small, and can usually be neglected. When, however, the oxygen is low, the reagents, being presumably saturated with oxygen under atmospheric conditions, will make the result too high. The correction then to be applied is:

$$x = \frac{1000 a - Rn}{V - n},$$

where x is the number of c.c. of oxygen per litre of the liquid, a the amount of oxygen in c.c. found by titration, V the volume of the bottle, and n that of the reagents, while R is the number of c.c. of oxygen contained in a litre of saturated water at the temperature of the experiment, which is preferably actually determined, or can be obtained from a table such as Roscoe and Lunt's (*C. S. J.*, 1889, 532).

The results obtained with good waters agree well together, and also with the figures recorded for boiling out *in vacuo*. Thus, in c.c. of O per litre a tap water in August, 1900, gave 5.93—corrected for reagents, 5.96; another observer found 5.97 uncorrected. Roscoe and Lunt's figure for saturated distilled water at the temperature 21°C ., 6.16. Next day the tap water showed 6.23 and 6.15. In November determinations gave 7.24, 7.20 and 7.33. Roscoe's figure for 13.5°C . is 7.2.

In the presence of nitrite equal to 2 parts of nitrous nitrogen per 100,000, previous oxidation by permanganate gave, as c.c. of free O per litre :

	Water I.	Water II.
Original—nitrite absent	5.97	6.64
With addition of 2 parts nitrite per 100,000 ...	{ 5.99 } 6.17	6.69

The following are other examples of the process :

	I.	II.	III.
Temperature	11.5° C.	14.0° C.	10.0° C.
Saturated water	7.54		7.74
Saturated water + 10 parts per 100,000 of N as nitrate		7.31	
Saturated water + 10 parts per 100,000 of N as nitrite, with previous permanganate treatment		7.26	7.62
Roscoe and Lunt's tables	7.52	7.40	7.77

In the presence of both organic matter and nitrite:—

A solution was made containing 10 per cent. of a very foul street washings, and 2 parts per 100,000 of nitrous N. This and an ordinary water were both saturated with oxygen by shaking. After the action on the polluted sample of permanganate, acid and oxalate as described, the dissolved oxygen was determined. The ordinary water gave 8.23, the polluted 6.29, 6.16, 6.19, and 6.39.

The quantity of nitrite was then doubled, =4 parts nitrous N per 100,000, about the maximum quantity we have found in effluents. The original gave 6.18 and 6.21 c.c. O per litre; the nitrited sample after the permanganating process gave 6.19.

The results should be expressed in actual c.c. of O found per litre, with the temperature of the water. The "percentage of saturation" calculated from Roscoe and Lunt's table should be appended.

Deviations from theoretical amounts may to a certain extent be produced by physical causes. With falling temperatures the water may not have had time to take up its complement of oxygen; on the other hand, with rising ones it may have an excess. Seyler and Gill (*Chem. News*, lxxvii., 87) showed that the temperature might be raised from 1° to 9.5°, or from 13° to 26.5°, with little loss of oxygen, the water remaining supersaturated until shaken vigorously. This condition of supersaturation is not infrequent, especially if the water has been under pressure in pipes.

In a paper by Dr. Adeney* on "The Application of the Aeration Method of Analysis to the Study of River Waters," he points out (p. 361) that "the composition of the dissolved gases in still waters alters very slowly with alterations of temperature, so that samples of a good fresh river water may be, and probably always are, either oversaturated or undersaturated with oxygen for the temperatures of the water at the times of collection." This does not affect, however, the comparison of a series of samples collected at near the same time, if, as we advise, the amount of oxygen dissolved in local tap water be simultaneously ascertained.

Dr. Adeney in this paper gives a number of striking examples of the significance of free dissolved oxygen, as indicating the condition and progress of change in mixtures of sewage and river waters. He has made his determinations gaso-

* *Proc. Royal Dublin Society*, ix., 3, No. 25, September 3, 1900.

metrically, and includes the amount of nitrogen and carbonic acid. His figures show that the range of variation of the nitrogen (13 to 15.5 c.c. per litre, and only 18.5 in a very foul crude sewage) is much less than that of the oxygen (7.5 to nothing), and that the amount of carbonic acid is largely affected by rain.

We believe, therefore, in the value and necessity of immediate and also progressive determinations of dissolved oxygen, and we have shown that by our modified Winkler process it is possible to ascertain the amount of free oxygen rapidly in the field in waters so coloured and polluted as to be amenable, as far as we have ascertained, to no other process.

Dr. Rideal also exhibited a graduated bulb apparatus that he had had made, which obviated the use of pipettes.

DISCUSSION.

Mr. DIBDIN said that he had systematically contended that the degree of aeration was one of the most important factors in determining the quality particularly of sewage effluents, or the character of river water apart from any particular effluent: for the question applied to the examination of rivers as much as to the examination of any particular effluent or water-supply. There was one point as to which he would have liked to have further information, namely, as to how far this method compared with the gasometric process; because, in the course of numerous experiments upon the determination of dissolved oxygen in the water of the river Thames, he had noticed serious discrepancies in the results obtained by various volumetric processes. Naturally, he had not been content to let the matter rest there, but had tried in many ways to overcome the difficulty. Of course, the question of nitrites was almost an obvious one, but he had also had in mind other substances, such as those contained in the water discharged from gasworks, which would affect the question to a greater or less extent. In the case of the Thresh and Schutzenberger processes, he made experiments to ascertain whether it was possible to eliminate the discrepancies by subjecting the samples of water to oxidation by potassium permanganate. He was sorry, however, to say that, as far as his experiments went, the results were not so satisfactory as he had hoped they might be, and consequently he had adhered to the gasometric process for all work in which accuracy was of importance. For the purpose of indicating a degree of aeration of 50 per cent. or over, volumetric processes were undoubtedly satisfactory; but in cases in which the degree of aeration was lower than 50 per cent., results were obtained which were altogether unreliable. If the author could give some results showing how determinations made by this modification of the Winkler process compared with gasometric determinations, a better opportunity would be afforded of judging as to its value. Nevertheless, whether it was absolute or not, it must be admitted that a process which was portable, and could be applied upon the works or upon the river-bank, offered great advantages. There were many such processes, but certainly those referred to in the present paper were to be ranked as among the simplest of any of the kind that he had seen.

Mr. WYNTER BLYTH said that some years previously he had had considerable experience of the Winkler method in examining the rivers of Devonshire, and he had

found it extremely convenient. He had, however, been troubled by the presence of organic matter, but not of nitrites, because the waters of the Devonshire rivers were fairly soft, and the quantity of nitrites in them was infinitesimal. He could not conceive anything that would be more advantageous in testing the pollution of rivers than an oxygen process, because one could go down in a boat and compare the condition of the river above and below the point at which a particular effluent was discharged, the results obtained in many cases being very striking. He might perhaps make one criticism on the apparatus now described, namely, that the accurate measurement of the 10 c.c. run out by means of the mark on the tube would necessarily be somewhat difficult, owing to the comparatively large diameter of the tube; and he would suggest that the tube might with advantage be made narrower, so that an accurate reading could be more easily taken.

Dr. RIDEAL, in reference to Mr. Wynter Blyth's suggestion, said that, as a matter of fact, the best plan was to run out the 10 c.c. into a small measuring vessel. In answer to Mr. Dibdin's criticism, he regretted that at present this modification of Winkler's process had not been compared with the gasometric method for very small quantities of dissolved oxygen. It had, however, been satisfactorily ascertained that the method did give very good results as compared with any other volumetric process; and there was no doubt that the addition of the permanganate beforehand, so as to destroy nitrites, gave far more accurate results. Instead of comparing the method by direct experiment with gasometric processes, it had been compared with Roscoe and Lunt's figures for fully aerated water, which were obtained by interpolation between actual determinations by the gasometric process at intervals of 5°. Their figure for pure water at a temperature of 20° C. was 6.28, and that yielded by this process 6.11; while in the presence of 5 parts per 100,000 of nitrous nitrogen the figure obtained by this process was 6.15. Even in the presence of nitrites, ferrous iron and a large quantity of organic matter, this process gave results almost identical with the gasometric figures.

DETECTION AND ESTIMATION OF PRESERVATIVES IN MILK.

BY MEREDITH WYNTER BLYTH, B.A., B.Sc.

(Read at the Meeting, March 6, 1901.)

THE use of preservatives in milk has made it necessary for those engaged in the examination of dairy products to spend a great amount of time in the search for the various substances used for this purpose. Some chemists are in the habit of looking for preservatives only in those samples which show no signs of decomposition after a definite length of time; but, as more often than not the time that has elapsed since the milk left the cow is unknown, this method is bound to lead to fallacious results, as the state of decomposition of a milk depends not only on the factor of time, but also on the incubation temperature, and the number and nature of the micro-organisms present in the milk.

The decomposition of milk may, however, be made the basis of a test for

preservatives if we bring the samples (1) to the same degree of alkalinity, (2) to the same bacterial condition, (3) to the same incubation temperature.

Having made a large number of experiments at different temperatures and under various conditions, I find that the following method gives excellent results, the primary object of the test being to enable analysts to examine easily a large number of samples without a great waste of time :

EXAMINATION FOR PRESERVATIVES.

1. Measure 10 c.c. of each milk into clean, wide test-tubes.
2. Measure 10 c.c. of a sterile milk, known to be free from preservatives, into a test-tube (these control tubes can be kept ready for use).
3. Add to each milk and to the control 2 c.c. of a very strong slightly alkaline solution of litmus. Now examine all the tubes, and if any of them are not the same shade of blue as the control tube, drop in drop by drop a half-normal solution of sodium hydrate until the correct shade of blue is obtained. This will be found unnecessary in the case of most milks, and will only be necessary when the milks are two or three days old ; this process must then be done very carefully.
4. Plug all the tubes with cotton-wool, and heat them in a water-bath kept at a temperature of 80° C. for ten minutes.
5. Allow the tubes to cool, and inoculate each, including the control, with $\frac{1}{2}$ c.c. of sour milk in water ($\frac{1}{2}$ c.c. milk to 100 c.c. water). Shake the tubes well. Now let the tubes stand for twenty-four hours at any temperature between 15° C. and 22° C., and then examine. If the control tube is not white, or nearly so, they must be allowed to stand for a longer period.

Those tubes which contain preservatives will remain blue or pink, while the tubes containing no preservatives will behave in the same way as the control tubes, becoming quite white.

The length of time the blue or pink colour takes to become white depends upon the quantity of preservative present in the sample.

The quantities of the more common preservatives which can be detected with certainty by this method are 0.005 per cent. of borax, boracic acid, or mixtures of these substances, 0.05 per cent. of salicylic acid, and 0.0003 of formic aldehyde, quantities very much smaller than are ever found, or which would be of any value in commercial milks. Having selected by this method those samples which contain preservatives, the nature of those preservatives must be determined by the ordinary methods.

ESTIMATION OF PRESERVATIVES.

The quantity of any preservative in milk may be estimated by a modification of the process just described. It is not of much use in the case of borax, boracic acid, or salicylic acid, as the usual chemical methods are for these substances of greater accuracy than the method to be described ; it may, however, be used even with these substances as a control on the results obtained by chemical estimation.

With formic aldehyde the case is different, the chemical methods for the determination of small quantities of this preservative being very unsatisfactory ; and

since it has a very high antiseptic value, formic aldehyde is admirably adapted to estimation by bacteriological means. The estimation may be made as follows:

Take two test-tubes, and measure into each tube 10 c.c. of the milk containing formic aldehyde (solutions A). Take 10 c.c. of the original milk, and dilute to 100 c.c. with milk free from preservative; measure out two tubes as before (solutions B).

Take 10 c.c. of solution B, and dilute to 100 c.c. with milk free from preservatives; measure out two tubes as before (solutions C).

Prepare three control tubes of 10 c.c., each containing 0.005 per cent., 0.003 per cent., 0.001 per cent. of formic aldehyde respectively (control A).

Prepare four control tubes of 10 c.c., each containing 0.001 per cent., 0.0008 per cent., 0.0005 per cent., 0.0003 per cent. of formic aldehyde (control B).

Treat all the tubes with litmus, heat to 80° C., cool and inoculate in exactly the same manner as if testing for the presence of preservatives.

Place one tube of solution A, one tube of solution B, one tube of solution C, and the three control solutions A, in the warm incubator at 38° C. for twenty-four hours.

Place all the other tubes in the cool incubator at about 22° C. for twenty-four hours.

From a comparison of the colours of the various tubes after twenty-four hours, a very close estimation can be made of the quantity of preservative originally present in the milk, providing that quantity does not exceed 0.5 per cent.; if it exceeds this number still greater dilutions must be made.

The estimation of formic aldehyde should be made either on the fresh milk or on a portion of the milk which has been partially sterilized at 80° C.; but even in this latter case there seems to be some loss of the aldehyde in twenty-four hours.

It is apparently impossible by this method to get an accurate estimation of formic aldehyde by distilling off the aldehyde and estimating it in the distillate, because the distillate possesses a higher antiseptic value than the formic aldehyde originally placed in the milk will account for; this increase is no doubt due to some distillation product of the milk. Further experiments are being made on this point.

DISCUSSION.

Mr. RICHMOND said that during the reading of the paper a doubt whether all the organisms in milk would be destroyed by heating to 80° C. had passed through his mind, but second thoughts convinced him that the organisms in the quantity of sour milk added were so enormously in excess that the few which might remain could have no practical effect. The method seemed to be an excellent one to enable samples of milk to be sorted with a minimum of trouble, so that only those need be examined which probably contained preservatives. With reference to the author's remark to the effect that the distillate from milk was more antiseptic than the milk itself, it was, he thought, firmly established that when formaldehyde was added to milk it combined with the proteids and gradually disappeared. These proteids had not the same properties as those in the original milk. For instance, when heated with hydrochloric acid they were much more difficult to dissolve than the proteids of the original milk. Now, it was extremely probable that the action of the micro-

organisms on the milk containing these altered proteids was not the same as in the case of milk with unaltered proteids, but was in fact likely to result in a greater development of acidity; on distillation, especially in a faintly acid solution, formaldehyde would pass over from the compound, and when the distillate was added to milk would, before combination took place, exert its full antiseptic effect, and this seemed to be a reasonable explanation of what the author had observed. In conjunction with Mr. J. B. P. Harrison he had made some experiments on the rate at which acid developed in milk, and had found that when milk treated with formaldehyde began to go sour it went sour at a very much greater rate than milk not so treated. In some cases it was actually found that, after two or three days, milk treated with formaldehyde contained more acid than untreated milk, while in the earlier stages it contained very much less.

Dr. RIDEAL remarked that, since the organisms present in milk were not only those which produce souring, a preservative might have an inhibiting effect on organisms other than those which produced a souring effect. To test the presence and estimate the amounts of preservatives by means of a mixed breed of souring organisms would not necessarily give any indication as to the value of the preservatives for preserving milk from other organisms than those of the particular kind used for testing. He believed it was not generally known or generally recognised that, although the lactic-acid-producing organisms were the organisms usually present having a souring effect, organisms of the *Coli* group, which many observers have found in milk, had also this particular property.

Mr. M. WYNTER BLYTH, in reply, said that his object in heating the milk to a temperature of 80° C. for ten minutes was to kill all organisms except spore-bearing organisms, which in twenty-four hours were not incubated out sufficiently to affect the results. He first of all tried inoculating samples with specific bacilli—*B. coli communis*, and various others—but found that there was no advantage to be obtained in that way over merely inoculating with a very dilute solution of sour milk. With regard to Dr. Rideal's suggestion that the acid-forming organisms could not be used for determining the power of an antiseptic, he (Mr. Blyth) thought that the organisms which decolorized litmus were not necessarily acid-forming organisms, or one would expect the litmus to be turned red. With borax and boracic acid the blue colour disappeared into white without any intermediate red stage, so that there would not seem to be a great number of acid-forming organisms present. The organisms seemed to act on the litmus itself and destroy the colour.

NOTE ON THE APPROXIMATE ESTIMATION OF FORMALDEHYDE IN MILK.

By J. F. LIVERSEEGE, F.I.C.

(Read at the Meeting, March 6, 1901.)

IN September, 1899, I commenced some experiments on the determination of formaldehyde in milk, and, though other work prevented me from continuing the investigation, a short account of my results may be of interest in connection with Mr. M. Wynter Blyth's paper (see preceding paper).

The reagent used was strong pure sulphuric acid, with 2.5 c.c. normal ferric chloride added per 100 c.c., this being the proportion which experiment showed gave the best colour with formalin in milk. Four mixtures were made containing 0.05, 0.5, 5, and 50 parts of formaldehyde per 100,000 of milk. When a small quantity of each milk was floated on to the reagent and allowed to stand all night, the one containing 0.5 gave an intense violet ring, the one containing 50 parts hardly showed any colour, and the other two gave distinct violet rings. Evidently this was of no value for quantitative work.

After trying shaking various quantities of milk with the reagent I arrived at the following method of working: Ten c.c. of each sample of milk were taken, placed in a 25 c.c. stoppered cylinder, and the reagent was added—preferably from a burette—1 c.c. at a time, to each cylinder in turn, and the colour was observed. The larger the proportion of formaldehyde the sooner does a violet colour appear, and on the addition of more reagent the intensity of the colour increases up to a certain point. The following table will illustrate this:

Reagent. c.c.	Formaldehyde present per 100,000.			
	0	0.5	5	50
2nd	0	0	0	Pale violet.
4th	0	0	Pale violet	Intense violet.
6th	Brownish-yellow	Reddish-violet	Intense violet	Violet, paler than 5.

No distinction could be made between milk with 0.05 per 100,000 of formaldehyde and that containing none. Another example in which the colours were quite distinct all through the experiment will suffice:

Reagent. c.c.	Formaldehyde present per 100,000.			
	0	1	5	10
2nd	Yellow	Buff	Violet	Violet.
4th	Yellow	Violet tinge	Violet	Dark violet.

In practice, the acid is added to 10 c.c. of milk side by side with standard samples, and they are compared after the addition of each c.c. of reagent. The standard samples were made from an aqueous solution of formaldehyde prepared by diluting 1 c.c. of formalin with water to 350 c.c., and assaying by the iodometric method (ANALYST, xxii., 221). I may say that a decided excess of iodine is necessary, or the results may be very much too low. The solution was then diluted to contain 1 part of formaldehyde in 10,000. This solution keeps very well.

Whether the quality of the milk makes any difference to the intensity of the colour, and if there is any advantage in cooling the cylinder between the addition of each c.c. of the reagents, are points that require investigation.

SOME ANALYSES OF OATMEAL.

BY BERNARD DYER, D.Sc.

VERY meagre information is given in easily accessible English books of reference on the subject of oatmeal. In Thorpe's "Dictionary of Applied Chemistry" the average is given of nine analyses by König (chiefly), and also the average of six analyses of American oatmeal by Johnson, from the Report of the Connecticut Agricultural Station for 1888. In the two averages the proportions of albuminoids (nitrogenous substances) are given respectively as 15.0 per cent. and 14.7 per cent., and the proportions of fat as 6.6 per cent. and 7.1 per cent. In Wynter Blyth's "Manual of Foods" the mean composition of oatmeal is given, showing 11.73 per cent. of albuminoids (nitrogenous matter) and 6.04 per cent. of fat. In Church's manual, "Food," an analysis of Scotch oatmeal is given, showing 16.1 per cent. of albuminoids and 10.1 per cent. of fat, and one of Irish oatmeal showing 14.8 per cent. of albuminoids and 8.8 per cent. of fat.

A short time since I happened to have a number of samples of oatmeal submitted to me for analysis as to genuineness under the Sale of Food and Drugs Act, and I took the opportunity of making a proximate analysis of each, thinking that the results might possibly be useful to myself or to others for subsequent purposes of reference, and in pursuance of this idea I have brought the results together in the following table.

I may mention that the figures given in the column headed "Albuminoids" are obtained by multiplying the percentages of total nitrogen by 6.25, and do not express true albuminoids as distinguished from other nitrogenous bodies.

The indigestible fibre is obtained in the way ordinarily employed in the analysis of feeding stuffs, and the figures in the column headed "Starch and other Digestible Carbohydrates" are obtained merely by "difference."

Thirteen of the samples were what would in common language be described as "fine oatmeal," six were of various grades that would ordinarily be described as "coarse oatmeal," while eight samples represented proprietary preparations in common use, consisting of crushed or flattened oats rather than of what is ordinarily described as oatmeal.

It will be seen that the albuminoids, calculated by multiplying the percentage of nitrogen by 6.25, varied from about 13 to over 18 per cent. In ten cases the proportion of albuminoids did not exceed 14 per cent.; in ten cases it was from 14 to 15 per cent.; in five cases from 15 to 16 per cent.; and in two cases over 18 per cent. In the two cases in which the albuminoids reached 18 per cent., the proportions both of ash and indigestible fibre will be seen to be large, as though the proportion of farinaceous substance to integument was smaller in these cases.

As regards oil or fat, it will be seen that in no case did the proportion fall as low as 7 per cent. In five cases it was between 7 and 8 per cent.; in eight cases between 8 and 9 per cent.; in ten cases from 9 to 10 per cent.; in two cases between 10 and 11 per cent.; and in two cases a little over 12 per cent.

	Moisture.	Oil.	Albu- minoids.	Starch and other Diges- tible Car- bohydrates.	Indiges- tible Fibre.	Total Ash.	Ash in- soluble in Dilute Hydro- chloric Acid.	Nitro- gen.
Fine oatmeal ...	9.07	9.53	16.00	60.86	2.07	2.47	.17	2.56
" "	9.10	8.95	14.81	63.71	1.50	1.93	.07	2.37
" "	9.53	8.63	13.06	65.65	1.30	1.83	.07	2.09
" "	9.17	9.17	13.62	64.94	1.20	1.90	.17	2.18
" "	9.00	9.23	12.94	65.76	1.10	1.97	.10	2.07
" "	8.83	12.23	18.19	54.65	2.20	3.90	.10	2.91
" "	9.00	8.60	14.00	65.46	1.17	1.77	.10	2.24
" "	8.27	10.63	14.44	62.79	1.70	2.17	.13	2.31
" "	9.10	9.97	13.94	63.16	1.70	2.13	.13	2.23
" "	8.60	12.33	18.44	54.40	2.20	4.03	.27	2.95
" "	8.83	8.67	13.12	66.31	1.20	1.87	—	2.10
" "	8.20	9.70	15.31	62.09	1.80	2.90	.17	2.45
" "	8.33	9.37	14.93	63.81	1.43	2.13	.03	2.39
Coarse oatmeal	7.97	8.77	15.18	65.15	1.03	1.90	.07	2.43
" "	9.00	10.23	13.06	65.07	.87	1.77	.10	2.09
" "	8.33	9.07	14.31	65.25	1.07	1.97	.07	2.29
" "	8.43	8.73	15.46	64.51	1.07	1.80	.07	2.49
" "	7.93	9.00	14.93	65.04	1.13	1.97	.10	2.39
" "	9.17	9.37	13.69	64.84	1.13	1.80	.07	2.19
Crushed or flat- tened oats ...	8.70	7.57	14.93	66.13	.97	1.70	.10	2.39
" "	8.17	7.80	14.44	66.82	.87	1.90	.10	2.31
" "	8.57	7.87	13.94	67.02	.87	1.73	.07	2.23
" "	8.93	8.43	14.44	65.50	.87	1.83	.07	2.31
" "	9.03	7.63	14.56	66.21	.80	1.77	.07	2.33
" "	9.27	9.30	12.68	66.21	.87	1.67	.07	2.03
" "	8.77	8.17	15.18	65.24	.87	1.77	.07	2.43
" "	8.60	7.53	14.81	66.12	1.17	1.77	.07	2.37

The "fibre" showed variations from 0.80 to 2.20 per cent., and the ash from 1.67 to 4.03 per cent.

DISCUSSION.

Mr. LING inquired whether any determinations had been made of the furfural-yielding carbohydrates.

Mr. CHAPMAN (Hon. Sec.), in the absence of the author, said that the carbohydrates appeared to be represented by the two items "indigestible fibre" and "digestible carbohydrates" (the latter of which was obtained by difference), no further differentiation of the carbohydrates having been made.

Mr. DIBDIN inquired whether all of the samples were genuine. So high a proportion of albuminoids as 18 per cent. seemed to point to some abnormality.

Mr. CHAPMAN said he was informed that all the samples were genuine.

Mr. HEHNER said that, in examining a specimen of one of the largely advertised preparations of crushed oats, he had found, rather to his surprise, that while the fat of oats and of fine or coarse oatmeal was largely composed of free fatty acid (as in the case of finely crushed seeds containing fat), the fat in this particular kind of oats contained practically no free fatty acid. The material had evidently undergone some process of treatment to neutralize the free fatty acid, somewhat in the same way in which cocoa was treated with ammonia to render it soluble; and this might possibly account for the high nitrogen contents of one or two of the samples referred to in the paper.

The PRESIDENT (Dr. VOELCKER) said it was certainly of great advantage that figures of this kind should be collected, so that there would not be the necessity of referring always to foreign authorities. At the same time, he had often felt that the mere collection of analytical results of food materials, without definite information as to the source from which the materials came, or of the circumstances under which they were produced, was likely to lead to a great deal of misapprehension. It was most valuable to have extended investigation into samples that had been produced in particular ways and under known conditions. If, for instance, in the present case information were available as to whether the terms "fine oatmeal," "coarse oatmeal," and "crushed or flattened oats," were simply names that happened to be put upon the samples in the course of collection, or whether they represented intrinsic differences between the different materials, it would enable some conclusion to be drawn as to how the average composition altered according to the more or less thorough removal of different portions of the grain. It was well known that in wheat, barley, or other cereals the removal of the different layers which covered the inner part of the grain made an enormous difference in the percentage of fat, and also in the nitrogenous constituents of the grain. The question of whether grain was highly nitrogenous or highly starchy depended upon two main conditions. The first was what was known as "maturation," or, in other words, the condition of things at the time of ripening—whether the grain had ripened rapidly, or whether the development and laying up of starch had been a gradual process. The second factor—a factor which, he thought, exercised more influence than it had yet been credited with—was the kind of soil upon which the particular grain had been grown. From the experience that he had acquired within the last two or three years in the growing of grain under different conditions, he was convinced that in the case, for instance, of wheat grown on the same soil and from the same variety of seed, hard wheat or soft wheat might be obtained according as the season was a rapid ripening one or one of mild and steady growth. If the weather were very hot just at the time of ripening, the plant was highly nitrogenous, and a "steely" grain was the result; whereas if the ripening were gradual, a more starchy and less nitrogenous grain would be obtained. Then, again, in growing the same seed—wheat, for instance—on two different soils, it might almost be said that it was possible to transform a soft wheat into a hard one, and *vice versa*. Such factors as these, therefore, must influence very much the value of tables of analytical figures, and render desirable more definite information as to what the particular products are, how they have been produced, and what is the influence of the surrounding conditions in altering their composition.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOODS AND DRUGS ANALYSIS.

The Estimation of Fat in Sweetened Condensed Milk by the Babcock Test. E. H. Farrington. (*Amer. Chem. Journ.*, xxiv., 267.)—When the Babcock test is applied to the estimation of fat in condensed milk which has been sweetened by sugar, a black flocculent substance separates in the neck of the test-bottle, and a satisfactory reading cannot be obtained. Extraction of the fat with ether is also unreliable. In such cases the following method, in which the sugar is first removed, has given good results. Sixty grammes of the condensed milk are weighed into a 200 c.c. graduated flask, the volume is made up to the mark with water, and 17.6 c.c. transferred to a Babcock test-bottle by means of a pipette. About 3 c.c. of the sulphuric acid used for testing milk are added, and, after mixing well, the bottle is whirled for six minutes in a centrifuge heated to 200° F. by means of steam; this causes the curd to shrink into a firm mass. If the curd is not broken, nearly all the whey, containing the sugar, can be decanted off. The curd is then shaken up with 10 c.c. water, and the whirling repeated after the addition of another 3 c.c. acid. The whey is again decanted, the curd shaken up with 10 c.c. water, 17.5 c.c. sulphuric acid added, and the test completed in the usual way. The small amount of sugar left does not interfere with the testing.

A. G. L.

The Occurrence of Methyl Alcohol in Fermented Fruit Juices. J. Wolff. (*Zeit. Untersuch. Nahr. Genussm.*, 1901, iv., 391-394.)—The author has examined the juices of various fruits before and after fermentation. With the exception of black currants, which yielded a distillate containing a trace, no methyl alcohol was found in any of the juices before fermentation. The distillates from the fermented juices were tested by Trillat's method (*ANALYST*, xxiv., 13, 212), and the following proportions by volume were found, calculated on 100 parts of 90 per cent. alcohol:

						Per Cent.
Black currants	...	...	...	...	...	Above 2
Plums	...	...	...	...	...	About 1
Damsons	...	...	...	...	...	„ 1
Mirabelles	...	...	...	...	...	„ 1
Cherries	...	...	...	...	...	0.5 to 1.0
Apples	...	...	...	...	...	0.2 „ 0.3
Grapes,	without stalks	...	...	...	...	trace „ 0.03
	with stalks	...	...	...	...	0.15 „ 0.4
	skins	...	...	...	...	0.15 „ 0.6

White crystalline sugar fermented with wine yeast produced no methyl alcohol. It is interesting to note that the brandy prepared from “marcs” invariably contains an appreciable quantity of methyl alcohol, whilst good cognac only gives uncertain indications in this test.

Rums, whiskies and commercial alcohols of different origin were found free from methyl alcohol. In the application of Trillat's test the following rules were observed :

1. In testing brandies, the quantity of liquid used corresponded to one containing 10 c.c. of 90 to 95 per cent. alcohol.

2. Blank tests were made with 10 c.c. of pure 90 to 95 per cent. alcohol, and tests with the same amount of alcohol containing 0.02 and 0.05 c.c. of methyl alcohol.

C. A. M.

Estimation of Total Extract and Free Acid in Wine. F. Freyer. (*Oesterr. Chem. Zeit.*, 1901, iv., 129.)—In view of the many possible sources of error in the usual process of determining the total extract in wines by evaporation, the author suggests that it would be better in all cases to arrive at this figure by taking the specific gravity of the sample before and after distillation of the alcohol, using either the Haas or the Windisch tables for the necessary calculations.

As regards the "free acid" in wine, Freyer remarks that the amount of alkali required for neutralization depends upon the presence of a large number of different acids, not all of which are yet accurately known; whereas the loss of acidity which wine undergoes on storage is almost entirely due to the separation of potassium bitartrate. But since 188 parts of tartar are equal to only 75 parts of free acid, the total extract decreases out of proportion to the loss of acidity of a wine as tartar is eliminated; so that the acid-free extract, which is an important factor in judging wine, is made to appear lower after separation of tartar than before. It is therefore desirable to make a special determination of the potassium bitartrate in the wine, to calculate this into its equivalent of free tartaric acid ($188 = 75$), to deduct the value so obtained from the total non-volatile acid by titration, and to return the difference as true free acid. The non-acid extract is then given by subtracting both the tartar and the corrected free acid from the total extract.

F. H. L.

Detection of Arsenic in Beer. (*Chemical News*, vol. lxxxii., pp. 302, 303; vol. lxxxiii., pp. 2, 22, 25, 26.)—A. W. Blyth (vol. lxxxii., p. 302) eliminates alcohol and carbon dioxide by boiling, adds caustic soda till alkaline, evolves hydrogen from sheet aluminium, and passes the gas through 1 c.c. of silver nitrate solution. This method will detect 0.01 milligramme of arsenious acid in 100 c.c. of beer, and is not interfered with by the presence of acid sulphites.

H. G. Madan (vol. lxxxii., p. 302) recommends a modification of Fleitmann's test: heating 6 to 8 c.c. of the beer, etc., to near boiling with 1 gramme of caustic potash, dropping a piece of aluminium foil into the solution, and applying to the mouth of the tube a strip of filter paper moistened with silver nitrate, which will blacken if arsenic be present. Sulphur and phosphorus, being detained by the alkaline liquid, do not interfere with the test.

J. S. Smith (vol. lxxxiii., p. 2) finds that arsenic can be detected, in the presence of sulphur compounds that give off sulphuretted hydrogen (on treatment with zinc and acid), by heating the evolved gases in Marsh's apparatus with the following precautions: Adding the solution to the zinc and acid by 1 to 2 c.c. at a time;

keeping the heated tube red hot for about 1 inch in the centre, to prevent loss; washing the cooled deposit with carbon disulphide, to remove sulphur, and afterwards with caustic alkali, to dissolve the arsenic sulphide. The final rinsings with water are added to the solution, and the whole is neutralized with hydrochloric acid, the precipitate being tested by the usual methods. Where the sulphur is insufficient to combine with all the arsenic, a metallic ring of the latter will form beyond the deposit of sulphide.

J. W. Gatehouse (vol. lxxxiii., p. 22) states that the method proposed by Madan (see above) was described by himself in 1873 (*Chemical News*, April 18). It is necessary to employ pure caustic alkali, some commercial qualities containing arsenic.

E. W. T. Jones (vol. lxxxiii., pp. 25, 26) recommends, as a *qualitative* test, concentrating 250 c.c. of the beer to about 100 c.c., adding 25 c.c. of strong hydrochloric acid, and immersing a strip of clean copper gauze in the boiling liquid for a quarter of an hour. If this be darkened, it is then heated in a (preferably elliptical) tube, and the sublimate examined under the microscope; crystals of arsenious oxide will be readily detected when $\frac{1}{20}$ grain per gallon is present. For glucose, etc., 50 grammes are dissolved to 100 c.c. in hot water, and treated in the same way.

In the *quantitative* test, two rolls of copper gauze (1 by $3\frac{1}{2}$ inches) are used alternately, the first being removed, after an hour's boiling, and freed from adherent deposit by 5 c.c. N. caustic soda (diluted to just cover the copper in a small beaker), and 3 to 4 drops of a 10 volume solution of hydrogen peroxide. The second roll is boiled for half an hour, and then treated as above, the process being repeated till no further deposit shows. The alkaline solution and washings are heated for an hour, filtered from the precipitated copper, and treated with 7 c.c. of normal sulphuric acid and a little pure sulphurous acid solution; then boiled to expel all traces of the latter, and treated with its own volume of saturated sulphuretted hydrogen solution, followed by gaseous H_2S . After standing over-night in a warm place, the deposited arsenious sulphide is filtered, thoroughly washed, dissolved in a minimum of hot dilute ammonia water, evaporated to dryness, taken up (when cool) with 2 to 3 drops of hot water, and slightly acidified with very dilute hydrochloric acid. It is then evaporated to dryness, treated with 2 to 3 drops of H_2S water, again evaporated, washed with a little water, dried, freed from sulphur by carbon disulphide, rinsed with strong alcohol followed by water, thoroughly dried, cooled, and carefully weighed. The arsenious sulphide is then dissolved with hot ammonia water, and the residual copper sulphide is dried and weighed, the difference giving the weight of arsenious sulphide present. The method will isolate 0.9 out of 1 grain of arsenious oxide added per 1 gallon of non-arsenical beer.

C. S.

New Therapeutic Agents of the Year 1900. A. Eichengrün. (*Zeits. angew. Chem.*, 1901, xiv., 261.)—I. (a) ANTISEPTICS FOR EXTERNAL USE: *Iodolen* (Laquer), a substance of doubtful value, is a compound of iodol (Squire, p. 373*) with albumin. *Iodylin* (Stephan) is an iodine derivative of unknown composition. *Iodozen* (Merrel)

* References to the seventeenth (1899) edition of Squire's "Companion to the British Pharmacopœia" have been interpolated into this article by the abstractor to save space.—F. H. L.

is iodized oil of winter-green, an American substitute for sanoform (p. 313). *Vioform*, made by the Basle chemical works, is iodochloroxyquinoline, and is advertised as a substitute for iodoform. *Proteol*, a secret preparation recommended in the same way, is presumably analogous to the compounds of formaldehyde and albumin. *Airogen*, like *airoform*, is simply an imitation of *airol* (p. 145). *Ibit* (Ges. Chem. Ind., Basle) is bismuth oxyiodotannate. *Crurin* (Edinger) is bismuth quinoline thiocyanate; commercially it varies somewhat in composition. *Marcasol* (Kress and Owen) is bismuth borate and phenoxide. *Mercuriol* (Schwickerath) is the mercury salt of nucleic acid. *Cuprol* is the similar copper compound, and *cupragol* (F. Bayer and Co.) is a compound of copper with proteic acid; but these are still in the experimental stage. *Nargol* is the silver salt of nucleic acid, and like the preparations argonin and protargol (p. 113), as well as those mentioned above, contains the metal firmly united to the organic molecule. *Ichthargan*, a compound of ichthyol and silver, on the other hand, is readily split up by hydrochloric acid and chlorides. *Ichthoform* is a derivative of formaldehyde and ichthyol sulphonic acid. The various solutions of phenols in ichthyol, formerly called *anytols*, have now been given special names, and include *metasol* for *m*-cresol-anytol, and *eucasol* for eucalyptus-anytol. This latter designation is unfortunately liable to cause confusion with the food-stuff eucasin. As competitors with ichthyol are now proposed, *ichthydrin*, a by-product in manufacturing the former; *illyrin*; *sphagnol*, or *corba oil*, a black tarry substance distilled from peat; and *Pir solubilis*, a soluble modification of the tar obtained by sulphonation.

I. (b) ANTISEPTICS FOR INTERNAL USE.—*Bromeigon* (Dieterich) and *iodeigon* are halogen derivatives of peptone (if soluble), or of albumin (if insoluble). *Bromocoll* (Brat) is brominated tanocoll (*i.e.*, gelatin-tannin). *Guaiakinol* (Castell) is the dibromoguaiacolate of quinine, or perhaps a compound of the formula



A body called "*eosolsaures Salz*" (Wendt) is very similar to thiocoll, and is probably a salt of acetylcreosotetrisulphonic acid. *Guaiamar* (Endemann) is the glycerol ester of guaiacol. *Guaiasanol* (Einhorn) is diethylglycocollguaiacol:



Fluoroform is made, according to Meslans, by the action of silver fluoride upon iodoform in aqueous solution. *Igazol* (Cervello) is stated to be a "compound" of formaldehyde with trioxymethylene and some iodine derivative; but the author finds it to be simply a mixture of paraform, iodoform and terpene hydrate. *Aniodol* (Sédan) is a solution of paraform in glycerol mixed with oil of mustard; but owing to the decomposition which occurs on dissolution is really a weak formaldehyde solution. *Lysoform* is a scented solution of formaldehyde in soap, much like lysol. *Phenolysolum hungaricum* and *basol* are merely new names for lysol. *Negrolin* and *kresosolvin* are new names for creolin; *saprol* is apparently something similar. *Pictolin* is a mixture of liquefied carbon dioxide and sulphurous oxide.

Two new substances are *epicarín* (Bayer), β -naphthol cresotinic acid, and *peruol* (Actienges. für Anilinfabr.), recognised by E. Erdmann as the active constituent of Peru balsam. The latter, dissolved in castor-oil, is called *peruscabin*. *Sapodermin*

and *lavodermin* are soap preparations containing about 3 per cent. of the mercury compound of casein. *Viscin* is birdlime (from the white mistletoe). *Chirol* is a solution of resins and fatty oils in ether-alcohol.

II. NEW DRUGS.—Two new hypnotics are *hedonal* (Beyer),



and *chloretone* (Parke Davis), which is simply acetonechloroform. Under the name of *anesone* acetonechloroform has been known for years as an anæsthetic. *Mannin* is the title given to an imitation of orthoform. Of antipyretics, *eupyrin* (Zimmer) is the ethylcarbonate of the condensation product of vanillin with phenetidine prepared by Goldschmidt. Others are acetylsalicylic acid, and the compound of pyramidone with camphoric acid (Höchst). *Acetopyrin* is the name given to the compound of antipyrine with acetylsalicylic acid; it is very unstable, losing the acetyl group. *Sidonal* (Jaffé and Darmstädter) is piperazine quinate, and *urosin* is lithium quinate. It seems questionable whether the effect of sidonal is not due to the piperazine, which is thus exhibited in unusually large doses; nevertheless, many other quinates are now being patented. *Kineurin* is quinine glycerophosphate. *Euchininum tannicum* is a perfectly tasteless gallate of euquinine. *Basicin* (Kreidmann) is a mixture of quinine hydrochloride and caffeine. *Yohimbine* is an alkaloid obtained from a West African plant. *Fortoin* (Zimmer and Co.) is the methylene compound of cotoin (Squire, p. 246). *Honthin* (v. Sztankay) is a Hungarian variant of tannalbin (p. 52), and is claimed to be an improvement. *Lactanin* (Schmoll) is bismuth lacto-tannate, prepared by acting upon bismuth tannate with lactic acid. *Bismuthan* (Kalle and Co.) is a combination of bismuth with albumin. *Ko-sam* is an extract of the *Brucea Sumatrana*. *Cascarin*, the active principle of the laxative *cascara sagrada*, has now been introduced commercially. *Ricinose* is merely a new name for castor-oil. *Gomenol* (Prevet and Co.) is a preparation of some New Caledonian plant. *Kalagua* is a Belgian tonic containing caffeine, presumably derived from the *Theobroma Kalagua*, a variant of the *Cacao*.

Furunculin, *staphylase*, *mycodermine*, *sitogen* and *force* are new malt preparations. *Buffo* is a dilute form of *toril*, a variety of beef extract. *Nervin* is a new extract of meat. *Zómol* is a soluble solid meat-paste. *Nectrianin* is a French product from the *Nectria ditissima* of apple and pear trees.

Tuberculin soap is a new preparation for external use. Behring and Ruppel have isolated free *tuberculinic acid* from its compound with tuberculosamine by treatment of the cultures with acetic acid; this substance is said to retain its activity without addition of glycerol longer than any others. *Tuberculol* is the name of an extract obtained by the fractional extraction at increasing temperatures of the tubercle cultures, and is reported to be more efficient, as the heat of the old process destroyed certain principles.

Pegnin is a rennet preparation which yields as finely divided a curd from cows' milk as from human milk. *Pankreon* (Thomas and Weber) is a preparation of the pancreas of high albumin-dissolving power, and capable of withstanding the stomach pepsin for a long time. *Robol* is an amylolytic and proteolytic ferment of secret character. *Roborin* and *roborat* are probably somewhat similar.

The mixture of methyl and ethyl chloride used for producing local anæsthesia is now called *kelenmethyl*, *anesthyle*, *metaethyl* and *anesthol*; orthoform is known as *mannin*; migranin is called *phenazon*. *Sycorin*, *glycosin* and *glycophenol* are fresh names for saccharin; and its methyl ester is called *amerol* in America (probably for tariff reasons, as it is hydrolyzed locally). Theurer's compound of albumin and hæmoglobin is called *perdynamine*; the starch syrup nutrol is now known as *nural*; and *mercurial* has been changed to *mercuroalga*m. Salts of cacodylic acid are being recommended in France in general therapeutics under the names of *arsykodyls*. *Persodine* is a mixture of ammonium and potassium persulphate. *Diathesin* is a name for saligenin. *Cystamin* (Squire and Sons) is hexamethylenetetramine; *cystogen* is an American name for the same. *Calmin* is a mixture of antipyrine and heroin; *antirhinol*, a mixture of tannin, salol and sandal oil. *Vitafer*, largely advertised as magnesium peroxide, is a mixture of magnesium carbonate and sodium sulphate, and contains only a trace of active oxygen.

F. H. L.

Notes on Phosphorated Oil. K. Stich. (*Wiener klin. Wochenschr.*, 1901, xiv., 177; through *Chem. Zeit. Rep.*, 1901, 96.)—The author finds that the limit of delicacy of Mitscherlich's test for phosphorus in oil is 0.2 milligramme per 100 grammes. Light, air, and rancidity appear of small influence upon the permanence of weak solutions, and this qualitative test succeeds equally when the samples are several weeks old. Quantitative results cannot be obtained by oxidizing the steam-distillates from phosphorated oil. It is better to dissolve the oil in benzene, precipitating with acetone and silver solution, and oxidizing the silver phosphide. This process should not be attempted for qualitative purposes, since cod-liver oil (without phosphorus) gives a black precipitate with the same reagents. Phosphorated oil stored in half-filled bottles yields a yellow amorphous deposit, partly consisting of a special modification of amorphous phosphorus, and partly of some product of imperfect oxidation.

F. H. L.

[*Cf. ANALYST*, 1899, xxiv., 91.]

TOXICOLOGICAL ANALYSIS.

Is the Blondlot-Dusart Method reliable in Medico-Legal Cases? Z. Halász. (*Zeit. anorg. Chem.*, xxvi., 438.)—Considerable doubt has been thrown on the reliability of this method for the detection of phosphorus since the publication of Selmi's dissertation on the occurrence of phosphorus bases in the urine and various organs in cases of acute phosphorus poisoning (*Archiv. d. Pharm.*, 1881, xix., 276). In the one case examined which had ended fatally, Selmi was able to obtain from the brain and liver three bases containing phosphorus, which evolved phosphoretted hydrogen in contact with nascent hydrogen. Consequently he suggested that the examination of the brain and liver might be of great importance in cases where it is impossible to detect free phosphorus, since the normal constituents of the brain containing phosphorus are derived from phosphoric acid, which is not reduced under any circumstances by nascent hydrogen.

In three works dealing with the subject which have appeared since Selmi's dissertation, reference is made to his work, and, his results evidently being misinterpreted, the Blondlot-Dusart method is stated to be unreliable. The author of the present paper has consequently investigated the question. As materials for his experiments he used fresh and more or less decomposed human brains, and brains of pigs and calves which had not been poisoned, and also the brains and other organs of rabbits poisoned in different ways by means of phosphorus. In each case the organ to be examined was macerated and mixed into a paste with recently boiled water. This paste was then treated with nascent hydrogen, obtained from zinc and sulphuric acid, in a flask heated on the water-bath. The gas was evolved for two hours, and passed through a large Pettenkofer tube containing silver nitrate. The resulting precipitate was filtered off, washed, and examined in a Dusart apparatus. This consists of a flask in which hydrogen is evolved, connected with an empty wash-bottle to retain moisture, leading to two U-tubes filled with pieces of potash, from which proceeds a glass tube terminating in a platinum nozzle, the gas being lit at the nozzle and examined in a dark room.

In no case was the green coloration of the inner zone of the flame which constitutes the Blondlot-Dusart reaction obtained when non-poisoned human brains and brains of pigs and calves in different stages of decomposition were examined in this way; nor could any phosphorus compounds volatile with water or alcohol be obtained from fresh or decomposed non-poisoned human brains. On the other hand, phosphorus compounds volatile with alcohol were found in the brains of rabbits poisoned by means of phosphorus, although these never showed the Blondlot-Dusart reaction. This reaction, however, was given by other organs, especially the stomach and intestines, as well as the liver, lungs and kidneys. It seems probable that before the phosphorus can reach the brain it is already in too oxidized a condition to give the reaction.

From his experiments the author concludes that the Blondlot-Dusart method may be used with perfect confidence in cases of phosphorus-poisoning. A. G. L.

Differentiation of the Blood of Different Animals. S. Cotton. (*Bull. Soc. Chim.*, 1901, xxv., 255-257.)—According to the results of the author's experiments, the blood of different animals varies in intensity in its action upon hydrogen peroxide, and on this he bases the following test: The fresh warm blood is expressed in a linen cloth until only the fibrin remains. The expressed liquid is shaken until homogeneous. One c.c. is then treated with 250 c.c. of hydrogen peroxide (12 vols.), and the liberated oxygen collected and measured.

In this way the following results were obtained:

						C.c.
Man ...	...	...	...	...	...	580 to 610
Horse...	...	...	...	...	...	320 „ 350
Pig ...	...	...	...	...	...	320 „ 350
Ox ...	...	...	...	...	...	165 „ 170
Guinea-pig	...	...	...	...	...	115 „ 125
Sheep...	...	...	...	...	...	60 „ 65

The blood of female and young animals gives somewhat higher results than that of old male animals.

C. A. M.

ORGANIC ANALYSIS.

Constants of Lard Oil. M. Duyk. (*Bull. de l'Ass. belge*, 1901, xv., 18, 19.)—The author gives the following results which he has obtained in the examination of lard oil: Solidification point about 10° C.; specific gravity at 14° C., 0.916; at 100° C., 0.8626; refractive index (Zeiss) at 40° C. = 52°; critical temperature (Crismer) in an open tube = 75° C.; Maumené figure (50 grammes of oil + 10 c.c. of sulphuric acid of 1.88 specific gravity) = 47° C.; iodine value (mean), 73; elaidin reaction; hard mass in a short time. Saponification value, 193; insoluble fatty acids, 97.4 per cent.; volatile fatty acids, 0.

The fatty acids melted at 35° C., solidified at 31° C., and had a specific gravity at 100° C. of 0.885.

C. A. M.

Oil of Walnut (*Juglans nigra*). L. F. Kebler. (*Amer. Journ. Pharm.*, 1901, lxxiii., 173, 174.)—The author states that he has prepared this by cold expression from the crushed kernels, the yield being 25 per cent., whilst the kernels contained 66 per cent. of oil.

The oil thus extracted was limpid and of a straw colour. It became turbid at -12° C., and had the following physical and chemical constants:

Specific gravity at 15° C.	...	...	...	0.9215
Saponification value	...	...	...	190.1 to 191.5
Acid value	...	...	...	8.6 „ 9
Ester value	...	...	...	181.5 „ 182.5
Hehner value	...	...	...	93.77
Reichert-Meissl value	...	...	...	15 c.c.
Iodine value	...	...	...	141.4 to 142.7
Melting-point of fatty acids	...	...	...	0° C.

Its drying properties were found to be equal, if not superior, to those of linseed oil. A flexible transparent film was obtained which was less liable to crack than the linseed oil film.

C. A. M.

Analysis of Oils containing Carvone. E. Kremers. (*Journ. Soc. Chem. Ind.*, 1901, xx., 16.)—This article consists essentially of a résumé of several papers already published by Kremers and his collaborators upon the determination of carvone as carvoxime.* The process is as follows: A quantity of the oil to be analysed, containing about 5 grammes of carvone, is dissolved in 25 c.c. of alcohol, and 5 grammes of hydroxylamine hydrochloride and 6.5 grammes of sodium bicarbonate are added. The mixture is boiled for half an hour on the water-bath under an inverted condenser, 25 c.c. of water are introduced, and the alcohol is distilled off. Steam is then passed through the flask and the distillation is continued, collecting the last portions of the distillate in separate test-tubes till traces of carvoxime crystals

* The previous articles will be found in *Journ. Chem. Soc.*, Abstracts, 1898, liv. [ii.], 358; 1900, lviii. [ii.], 117 and 631.—F. H. L.

appear on the surface of the liquid. The distillation is stopped, the condenser rinsed with a little hot water, which, together with the last distillates, is returned to the still. The whole is cooled, and when the oxime has solidified it is collected on a filter (removing what adheres to the flask by means of a loop of stiff wire), washed, and dried by suction. The product is finally heated for one hour on the water-bath and weighed. To the weight thus obtained 0.1 gramme is added to compensate for the loss by volatilization, and the carboxime so corrected is calculated into carvone by the factor 0.9088. It is desirable not to use more sodium bicarbonate than is equivalent to the hydroxylamine hydrochloride, while a large excess of the latter should also be avoided. The volatility of the oxime in presence of water vapour is somewhat irregular, therefore the drying should always be performed under similar conditions.

When oils are much resinified, the carboxime may refuse to crystallize; in such case the oil should be distilled with steam, and the process carried out on the distillate. A small quantity of resin will increase the weight of oxime recovered, and so tend to make the results too high. The melting-point of the carboxime, which should lie between 71° and 73° C., is lowered by the resin; but no idea of the amount of impurity can be obtained in this way, as the point at which melting begins in the impure oxime is not sharp. The point of complete liquefaction is more distinct, but it is not so much affected by the resinous matter. Copious tables are included in the original, which tend to show that the results are usually about 2 per cent. too low. The author considers that the method is by no means perfect, but is of much value; and it has the advantage of yielding a definite crystalline compound.

F. H. L.

Detection of Succinic Acid. C. Neuberg. (*Zeits. physiol. Chem.*, 1901, xxxi., 574; through *Chem. Zeit. Rep.*, 1901, 95.)—The author makes use of the pyrrol reaction, which enables him to detect 0.6 milligramme of succinic acid. The liquid to be examined, containing the succinic acid in the free state, is mixed with some ammonia and evaporated to a volume of about 1 c.c., absorbed in 1 gramme of powdered zinc, and the excess of ammonia gently driven off. Deal shavings moistened with strong hydrochloric acid are then suspended in the tube, which is heated till a pale or dark red colour appears on the wood, according to the amount of succinic acid taken. If the latter originally existed as a metallic salt, the same test will frequently succeed when ammonium carbonate is used in place of ammonia; or, to be quite certain, a few crystals of ammonium phosphate may be added to the concentrated ammoniacal liquor before introducing the zinc dust. The reaction is extremely delicate, and quite characteristic provided no substances capable of yielding pyrrol are present; in physiological work the only bodies which have to be considered are albumin, hæmin, and indol derivatives. These, however, can be easily separated from the succinic acid.

F. H. L.

INORGANIC ANALYSIS.

A New Volumetric Method for the Determination of Silver. Launcelot W. Andrews. (*Amer. Chem. Journ.*, xxiv., 256.)—The method is founded on that of Pisani, and is especially applicable to residual analyses of chlorides, bromides, etc., and to their estimation in water analysis. Owing to the powerfully oxidizing properties exhibited during the reaction in the original method, no distinct end-point could be observed, and in order to remedy this a ferrous salt is added, and also an equal amount of a ferric salt, the effect of the latter being to preserve a condition of equilibrium between the ferrous and ferric salts and iodine and iodide, as otherwise the ferrous salt would decolorize the starch iodide. The titration is carried out by means of $\frac{N}{20}$, $\frac{N}{100}$, or even weaker solutions of starch iodide, standardized against a $\frac{N}{10}$ solution of pure silver.

The starch iodide is prepared by grinding up 50 grammes starch with 8 to 9 grammes iodine, stirring the powder with 100 c.c. water, and heating the mixture for several hours in sealed tubes immersed in the water-bath, or in a flask fitted with a reflux condenser. The liquid obtained is diluted and filtered; it does not change on keeping. The silver solution to be titrated should contain nitric acid, but not more than 5 per cent., otherwise the ferrous salt would be oxidized. Mercury arsenious and antimonious salts must be absent, and nitrous acid should be removed by boiling; but phosphates, lead salts, and sulphurous acid are harmless.

To the silver solution so much ferrous salt is added that at least as much iron as silver is present, and then an equal quantity of a ferric salt. An excess of the latter must be added if sulphurous acid is present. The iron solutions are best kept on hand as sulphates, which just before use are converted into nitrates by the addition of lead or strontium nitrate. This is unnecessary if the silver solution contains less than 20 milligrammes Ag per litre, as no silver sulphate would crystallize out in that case. The starch iodide solution is then run in, not too rapidly, until the solution is coloured blue.

Starch iodide reacts with silver chloride, bromide, etc., and consequently, if larger quantities of silver are first precipitated with $\frac{N}{10}$ KBr, the solution must be filtered before finishing the titration with $\frac{N}{100}$ starch iodide. A. G. L.

Rapid Estimation of Small Quantities of Arsenic. A. Atterberg. (*Chem. Zeit.*, 1901, xxv., 264.)—The following method has been elaborated to avoid the use of gas generating apparatus, which are not always at hand when required. It depends on the fact that arsenious acid, when heated with strong hydrochloric acid, yields arsenious chloride, which can be completely condensed in water. On adding nitric acid and evaporating, arsenic acid is left, which in quantities of 0.01 milligramme or less can be detected by appropriate reagents—*e.g.*, molybdate, thiocetic acid, or hydrochloric acid solutions of stannous chloride and sodium hypophosphite. The organic matter of the sample (carpet, fabric, etc.) is destroyed by heating with 50 to 100 c.c. of 1.19 hydrochloric acid, 2 grammes of ferrous sulphate to reduce any arsenic acid, and, in the case of "bronze" (metallic) colours, 2 or 3 grammes of ferric chloride to dissolve any elementary arsenic. The vapours

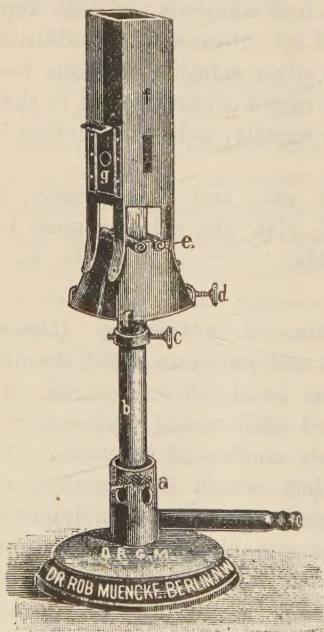
are led through a doubly bent tube into a 50 c.c. pipette, which stands with its lower end under 50 c.c. of water in a 100 c.c. flask, kept constantly cold. By the time the pipette has become hot, practically all the arsenic has distilled over, and the distillate is diluted with water to 100 c.c. Three c.c. thereof are then evaporated to dryness in a round-bottomed basin with 1 c.c. of 1.2 nitric acid; and when the acid fumes have disappeared, 0.5 c.c. of a solution of 1 gramme of sodium hypophosphite in 100 c.c. of 1.12 HCl is run in. Evaporating a second time, a more or less distinct gray or black ring is produced, according to the amount of arsenic present; and the latter may be estimated by colorimetric comparison with a standard solution. To prepare such a standard, 0.264 gramme of As_2O_3 is boiled with nitric acid and diluted to 1 litre; 10 c.c. of the solution being again diluted to 1000 c.c. : 3 c.c. (equivalent to 0.006 milligramme of As) are employed in each test.

F. H. L.

The Use of Copper and Silver Thiocyanates in Gravimetric Analysis.
 R. G. van Name. (*Zeit. anorg. Chem.*, xxvi., 230.)—*Copper Thiocyanate*.—It was found that in the presence of free sulphuric or hydrochloric acid complete precipitation was insured by using an excess—more than twice the theoretical quantity—of ammonium thiocyanate in a fairly dilute solution, and letting the precipitate stand for at least twenty hours before filtering. The precipitate was filtered through asbestos placed in a perforated crucible, dried for two or three hours at 110° , and weighed as $\text{Cu}_2(\text{CNS})_2$.

Silver Thiocyanate.—This compound may be used for the estimation of soluble thiocyanates. The solution is precipitated by adding an excess of silver nitrate, and the silver thiocyanate filtered, best after allowing it to stand for several hours, through asbestos dried for two or three hours at 110° , and weighed. The results were as satisfactory as those obtained by the use of Volhard's method.

A. G. L.



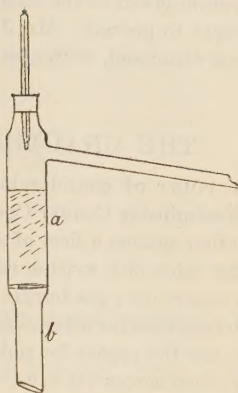
APPARATUS.

A Lamp for Monochromatic Light. F. W. Braun. (*Chem. Zeit.*, 1901, xxv., 69.)—In this burner the yellow light is derived from four rods of sodium laid in the metal coils marked *e*, shown in the annexed diagram. It is claimed that the lamp burns for a long time, is very cleanly, and is easy to manipulate.

F. H. L.

Fractionating Tube for Distillations under Diminished Pressure. W. Hirschel. (*Oesterr. Chem. Zeit.*, 1900, iii., 517.)—In this apparatus the wider tube *a* is about 90 mm. long and 20 mm. in diameter; it contains a platinum spiral of the same diameter as the glass, and in use is filled with glass balls 4 mm. in size. The narrower tube *b* is at least 15 mm. wide, and is fused to *a* after inserting the spiral. The device can be used with any flask; and at the end of a distillation the liquid retained among the balls is recovered by distilling a little ether through it. The ether expels the oil, etc., which falls back into the flask, and the superfluous ether can be removed by a current of air. The wire spiral is presumably claimed to permit the condensed distillate to return to the still during fractionation.

F. H. L.



ANALYSTS' CERTIFICATES—WEIGHING THE SAMPLE.

(Reprinted from the "*Pharmaceutical Journal*" of May 18, 1901.)

In the Divisional Court on Thursday, May 9, the Lord Chief Justice and Mr. Justice Lawrance heard a case of some interest to chemists. This was an appeal—*Sneath v. Taylor*—against a conviction under the Sale of Food and Drugs Act, 1875, the facts of the case being that in November last the appellant, Alfred Petchell Sneath, an employé of Edward Allen and Sons, Limited (grocers), Sleaford (Lincolnshire), sold to the respondent, an Inspector under the Act, one pound of butter which, upon analysis, was certified to be adulterated with 15 per cent. of margarine, and was, therefore, not of the nature, substance and quality demanded by the purchaser.

The case for the appellant was that the certificate of the Public Analyst was invalid because it omitted the weight of the sample which was sent to him for analysis. It was contended that, as the whole evidence of adulteration was the certificate of the analyst, the person who produced a certificate with the omission of the weight should show that the article could not have been conveniently weighed—which, of course, was impossible in the present case.

For the respondent it was submitted that some meaning must be given to the word "conveniently" in Section 6 of the Act, and that it was a matter for the discretion of the analyst whether or not he weighed the sample.

The Lord Chief Justice said that where weight was material the law was plain that it should be filled in, but where it was not shown or suggested that the insertion of the weight had anything to do with the sufficiency of the certificate they could not decide, as a matter of law, that it must be filled in before the certificate could be acted upon. The analyst was allowed a certain amount of latitude, because it was provided that when the article could not be conveniently weighed the words might be erased or the blank left unfilled. In that case the magistrate would have no means of knowing, except by the omission of the weight, that the analyst thought it was inconvenient that it should be weighed. In the case under consideration, the article being butter, it could have been weighed, and, therefore, the analyst ought to have filled in the weight. If the accuracy of the analysis depended upon the weight being known or the various constituents being ascertained, or if the certificate was faulty in the sense that it did not give the requisite information, a different conclusion might be arrived at; but, it being a direction, he could not say that the simple omission of the weight, having regard to the dis-

cretion given to the analyst, was enough to enable the Court to hold that the objection raised ought to prevail. Mr. Justice Lawrance agreed with his Lordship's remarks, and the appeal was dismissed, with costs.

THE UNAUTHORIZED PUBLICATION OF ANALYSTS' REPORTS.

A POINT of considerable interest to analytical and consulting chemists was decided at the Westminster County Court on May 1, 1901, when an engineer and sanitary plumber brought an action against a firm of analytical and consulting chemists, claiming damages for "deteriorating the value of a written report by writing upon it." The plaintiff obtained from the defendants a report on a gas burner in the ordinary way. This report was subsequently returned to the defendants for alteration. The defendants' suspicions being aroused that the plaintiff intended to use the report for publication, they returned it to him with the words "Not for publication" written across its face. Plaintiff contended that this made the report valueless to him, and stated that he considered he had a right to use the report in any way he thought fit. The defendants defended the action on the ground that it attacked the principle that such reports were made entirely for the information of the person applying to them, and not for use by way of publication and advertisement generally.

It was contended on behalf of the defendants that they had a perfect right to object to the publication of their report, and that the plaintiff could acquire no right whatever to publish it unless a special and distinct agreement as to publication had been first entered into, and, further that, the defendants being the authors of the report, they had, at common law, a right and power to prevent any infringement of their right in a printed or written unpublished document. He quoted in support of this contention the cases of *Lytton v. Devey*, *Hopkins v. Burghley*, and others, and relied upon the law as laid down by Vice-Chancellor Malins in the first-named case as follows:

"In my opinion the law upon the subject is plain, and has existed long before the case of *Pope v. Curl* was decided, and has existed ever since—namely, that the property in letters remains in the person to whom they are sent. The right to retain them remains in the person to whom the letters are sent, but the sender of the letters has still that kind of interest, if not property, in the letters which gives him a right to restrain any use being made of the communications which he has made in the letters so sent by him. I will not have it supposed that I entertain a moment's doubt about that being the settled law."

Evidence was called to show that it was the universal and recognised practice of the chemical profession to treat such reports as not for publication or advertisement without there being a special agreement permitting it.

In giving judgment, his Honour held that the defendants had established their contention that such a report was not for publication in the general sense, and that the plaintiff could not make use of it in the way he intended to. In the present case he saw a difficulty in that, the report having been once sent, it became the plaintiff's property, and that the defendants had exceeded their rights by writing across the report, after delivery, the words complained of, but that they would have been perfectly justified and within their rights in returning it with a covering letter stating that the report was not for publication, or in having written the words before the report originally left them. In the result his Honour held, however, that technically the defendants had exceeded their rights, but that there was no damage. He should therefore for the technical trespass award one farthing damages. This he afterwards altered to one shilling on its being pointed out that the County Court could not record a farthing. He, however, offered the defendants leave to appeal if so advised.